

*Medical Imaging 2008*

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# **Visualization, Image-Guided Procedures, and Modeling**

**Michael I. Miga**  
**Kevin R. Cleary**  
*Editors*

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- 6918 21 **Automatic needle segmentation in 3D ultrasound images using 3D improved Hough transform** [6918-72]  
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- 6918 22 **Low-cost respiratory motion tracking system** [6918-73]  
M. Goryawala, M. Del Valle, J. Wang, J. Byrne, Florida International Univ. (USA); J. Franquiz, Radiological Physics of South Florida, Inc. (USA); A. McGoron, Florida International Univ. (USA)
- 6918 23 **Effects of sensor orientation on AC electromagnetic tracking system accuracy in a CT scanner environment** [6918-74]  
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- 6918 24 **Assessment of the potential for catheter heating during MR imaging** [6918-75]  
B. Baek, San Francisco VA Medical Ctr. (USA); D. Saloner, San Francisco VA Medical Ctr. (USA) and Univ. of California, San Francisco (USA); G. Acevedo-Bolton, San Francisco VA Medical Ctr. (USA); R. Higashida, Univ. of California, San Francisco (USA); J. Comstock, San Francisco VA Medical Ctr. (USA); A. Martin, Univ. of California, San Francisco (USA)

- 6918 25 **3D transrectal ultrasound prostate biopsy using a mechanical imaging and needle-guidance system** [6918-76]  
J. Bax, D. Cool, Robarts Research Institute (Canada) and Univ. of Western Ontario (Canada); L. Gardi, J. Montreuil, E. Gil, J. Bluvol, K. Knight, D. Smith, Robarts Research Institute (Canada); C. Romagnoli, London Health Sciences Ctr. (Canada); A. Fenster, Robarts Research Institute (Canada) and Univ. of Western Ontario (Canada)
- 6918 26 **Phantom evaluation of an image-guided navigation system based on electromagnetic tracking and open source software** [6918-77]  
R. Lin, P. Cheng, D. Lindisch, F. Banovac, Georgetown Univ. (USA); J. Lee, Georgetown Univ. Hospital (USA); K. Cleary, Georgetown Univ. (USA)
- 6918 27 **Robotically assisted ultrasound interventions** [6918-78]  
J. Ding, Georgetown Univ. (USA) and Tianjin Univ. (China); D. Swerdlow, Georgetown Univ. Hospital (USA); S. Wang, Tianjin Univ. (China); E. Wilson, J. Tang, K. Cleary, Georgetown Univ. (USA)
- 6918 29 **Point-cloud-to-point-cloud technique on tool calibration for dental implant surgical path tracking** [6918-80]  
A. Lorsakul, J. Suthakorn, Mahidol Univ. (Thailand); C. Sinthanayothin, Advanced Dental Technology Ctr. (Thailand)
- 6918 2A **A real-time ultrasound calibration system with automatic accuracy control and incorporation of ultrasound section thickness (Best Student Paper Award – Second Place, Cum Laude Poster Award)** [6918-81]  
T. K. Chen, A. D. Thurston, M. H. Moghari, Queen's Univ. (Canada); R. E. Ellis, Queen's Univ. (Canada) and Kingston General Hospital (Canada); P. Abolmaesumi, Queen's Univ. (Canada)
- 6918 2B **A buyer's guide to electromagnetic tracking systems for clinical applications** [6918-82]  
E. Wilson, Z. Yaniv, D. Lindisch, K. Cleary, Georgetown Univ. Medical Ctr. (USA)
- 6918 2C **Visual servoing of a laser ablation based cochleostomy** [6918-83]  
L. A. Kahrs, J. Raczowsky, Univ. Karlsruhe (Germany); M. Werner, Ctr. of Advanced European Studies and Research (Germany); F. B. Knapp, Univ. Hospital Düsseldorf (Germany); M. Mehrwald, Univ. Karlsruhe (Germany); P. Hering, Ctr. of Advanced European Studies and Research (Germany) and Univ. of Düsseldorf (Germany); J. Schipper, T. Klenzner, Univ. Hospital Düsseldorf (Germany); H. Wörn, Univ. Karlsruhe (Germany)

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- 6918 2F **Towards registration of temporal mammograms by finite element simulation of MR breast volumes** [6918-86]  
Y. Qiu, X. Sun, V. Manohar, D. Goldgof, Univ. of South Florida (USA)
- 6918 2G **Modeling the influence of the VV delay for CRT on the electrical activation patterns in absence of conduction through the AV node** [6918-87]  
D. A. Romero, R. Sebastián, Univ. Pompeu Fabra (Spain); G. Plank, Johns Hopkins Univ. (USA); E. J. Vigmond, Univ. of Calgary (Canada); A. F. Frangi, Univ. Pompeu Fabra (Spain)

- 6918 2H **Mutual-information-corrected tumor displacement using intraoperative ultrasound for brain shift compensation in image-guided neurosurgery** [6918-88]  
S. Ji, Dartmouth College (USA); A. Hartov, Dartmouth College (USA) and Norris Cotton Cancer Ctr. (USA); D. Roberts, Norris Cotton Cancer Ctr. (USA) and Dartmouth-Hitchcock Medical Ctr. (USA); K. Paulsen, Dartmouth College (USA) and Norris Cotton Cancer Ctr. (USA)
- 6918 2I **Simulation of tomosynthesis images based on an anthropomorphic software breast tissue phantom** [6918-89]  
N. V. Ruiter, Univ. of Pennsylvania (USA) and Forschungszentrum Karlsruhe (Germany); C. Zhang, Univ. of Pennsylvania (USA) and Delaware State Univ. (USA); P. R. Bakic, A.-K. Carton, J. Kuo, A. D. A. Maidment, Univ. of Pennsylvania (USA)
- 6918 2J **Interactive modeling and simulation of peripheral nerve cords in virtual environments** [6918-90]  
S. Ullrich, T. Frommen, J. Eckert, A. Schütz, W. Liao, T. M. Deserno, RWTH Aachen Univ. (Germany); A. Ntoubas, R. Rossaint, A. Prescher, Univ. Hospital Aachen (Germany); T. Kuhlen, RWTH Aachen Univ. (Germany)
- 6918 2K **A fast stereo matching algorithm for 3D reconstruction of internal organs in laparoscopic surgery** [6918-91]  
Y. Okada, T. Koishi, S. Ushiki, T. Nakaguchi, N. Tsumura, Y. Miyake, Chiba Univ. (Japan)
- 6918 2L **Preliminary investigation of the inhibitory effects of mechanical stress in tumor growth** [6918-92]  
I. Garg, M. I. Miga, Vanderbilt Univ. (USA)
- 6918 2M **MITK-based segmentation of co-registered MRI for subject-related regional anesthesia simulation** [6918-93]  
C. Teich, W. Liao, S. Ullrich, T. Kuhlen, RWTH Aachen Univ. (Germany); A. Ntoubas, R. Rossaint, Univ. Hospital Aachen (Germany); M. Ullisch, Research Ctr. Jülich (Germany); T. M. Deserno, RWTH Aachen Univ. (Germany)
- 6918 2N **Dynamic lung tumor phantom coupled with chest motion** [6918-94]  
M. del Valle, M. Goryawala, A. J. McGoron, Florida International Univ. (USA)

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**POSTER SESSION: SEGMENTATION AND REGISTRATION**

- 6918 2O **Atlas-based segmentation of deep brain structures using non-rigid registration** [6918-95]  
M. F. Khan, Georgia Institute of Technology (USA); K. Mewes, R. E. Gross, Emory Univ. (USA); O. Škrinjar, Georgia Institute of Technology (USA)
- 6918 2P **Automatic initialization for 3D bone registration** [6918-96]  
P. Foroughi, Johns Hopkins Univ. (USA); R. H. Taylor, Queen's Univ. (Canada); G. Fichtinger, Johns Hopkins Univ. (USA) and Queen's Univ. (Canada)
- 6918 2Q **Accurate and reproducible semi-automatic liver segmentation using haptic interaction** [6918-97]  
E. Vidholm, Uppsala Univ. (Sweden); M. Golubovic, S. Nilsson, Uppsala Univ. Hospital (Sweden); I. Nyström, Uppsala Univ. (Sweden)

- 6918 2R **Continuous endoscopic guidance via interleaved video tracking and image-video registration (Honorable Mention Poster Award)** [6918-98]  
L. Rai, W. E. Higgins, The Pennsylvania State Univ. (USA)
- 6918 2S **Advanced 2D-3D registration for endovascular aortic interventions: addressing dissimilarity in images** [6918-99]  
S. Demirci, Technische Univ. München (Germany); O. Kutter, Technische Univ. München (Germany) and Deutsches Herzzentrum München (Germany); F. Manstad-Hulaas, St. Olavs Hospital (Norway) and Norwegian Univ. of Science and Technology (Norway); R. Bauerschmitt, Deutsches Herzzentrum München (Germany); N. Navab, Technische Univ. München (Germany)
- 6918 2T **Location constraint based 2D-3D registration of fluoroscopic images and CT volumes for image-guided EP procedures** [6918-100]  
R. Liao, Siemens Corporate Research (USA); N. Xu, Vanderbilt Univ. (USA); Y. Sun, Siemens Corporate Research (USA)
- 6918 2U **Left atrium segmentation for atrial fibrillation ablation** [6918-102]  
R. Karim, R. Mohiaddin, D. Rueckert, Imperial College London (United Kingdom)
- 6918 2W **A hybrid method for reliable registration of digitally reconstructed radiographs and kV x-ray images for image-guided radiation therapy for prostate cancer** [6918-104]  
Y. Song, B. Mueller, M. F. Chan, S. E. Sim, B. Mychalczak, Memorial Sloan-Kettering Cancer Ctr. (USA); X. Huang, Lehigh Univ. (USA)

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- 6918 2Z **Interactive tissue separation and visualization with dual-energy data on the GPU** [6918-107]  
F. Vega-Higuera, B. Krauss, Siemens AG (Germany)
- 6918 30 **Faster, higher quality volume visualization for 3D medical imaging** [6918-108]  
A. D. Kalvin, Akimbo Technologies (USA); A. F. Laine, T. Song, Columbia Univ. (USA)
- 6918 31 **Gaussian weighted projection for visualization of cardiac calcification** [6918-109]  
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- 6918 32 **Interactive multimodality display environment with photographic overlay enhancement for epilepsy surgical planning** [6918-110]  
A. Wang, Univ. of Western Ontario (Canada), Robarts Research Institute (Canada), and Atamai Inc. (Canada); S. Mirsattari, London Health Sciences Ctr. (Canada); D. G. Gobbi, Atamai Inc. (Canada); F. Bihari, London Health Sciences Ctr. (Canada); P. Das, Atamai Inc. (Canada); Q. Zhang, Robarts Research Institute (Canada) and London Health Sciences Ctr. (Canada); T. M. Peters, Univ. of Western Ontario (Canada), Robarts Research Institute (Canada,) and London Health Sciences Ctr. (Canada)
- 6918 33 **The architecture and performance of CAVASS** [6918-111]  
G. Grevera, St. Joseph's Univ. (USA) and Univ. of Pennsylvania (USA); J. Udupa, D. Odhner, Y. Zhuge, A. Souza, Univ. of Pennsylvania (USA)
- 6918 34 **High-quality anatomical structure enhancement for cardiac image dynamic volume rendering** [6918-112]  
Q. Zhang, Robarts Research Institute (Canada) and Univ. of Western Ontario (Canada); R. Eagleson, Robarts Research Institute (Canada), Univ. of Western Ontario (Canada), and Canadian Surgical Technology and Advanced Robotics (Canada); G. M. Guiraudon, Robarts Research Institute (Canada) and Canadian Surgical Technology and Advanced Robotics (Canada); T. M. Peters, Robarts Research Institute (Canada) and Univ. of Western Ontario (Canada)
- 6918 35 **A new visualization method for 3D head MRA data** [6918-113]  
S. Ohashi, M. Hatanaka, Muroran Institute of Technology (Japan)
- 6918 36 **Multispectral image enhancement for H&E stained pathological tissue specimens** [6918-114]  
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**Ivo Wolf**, German Cancer Research Center (Germany)  
**Guy Shechter**, Philips Research North America (USA)
- 3 Image Guidance  
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- 4 Registration and Targeting  
**Jay B. West**, Accuray, Inc. (USA)  
**Steven L. Hartmann**, Medtronic Navigation (USA)
- 5 Cardiac Planning and Guidance  
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- 6 Keynote and Modeling  
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## Introduction

Welcome to the 2008 edition of the SPIE Visualization, Image-Guided Procedures, and Modeling conference proceedings. The conference has evolved into a premier venue for our field, where one can see the latest advances as well as catch up with old friends. The conference is also an ideal venue for students to gain an understanding of the research community and student participation has always been strong. This year we received approximately 142 abstract submissions with 114 acceptances. This number of submissions represents a 25% increase over the previous year and shows how this field is expanding. The conference showcased 60 oral presentations and 54 posters.

This year is the first year that we extended the scope of the conference to include 'Modeling' and many new submissions in this area were forthcoming. Given the growing use of models within therapeutic interventions, we anticipate a continued increase in contributions from this area. We also had an excellent keynote speaker in Robert Howe, PhD, from Harvard University who crystallized the integrated use of models, robotics, and guidance with a fascinating talk. In addition, we featured a new workshop, 'Modeling for Therapy Guidance and Medical Imaging.' Both academic and industrial speakers presented and the workshop was very well attended. As we move to Orlando, Florida for the 2009 meeting, we anticipate another increase in the number of submissions and encourage your active participation including your innovative and novel abstracts. We look forward to your continued contributions and support.

It would not be possible to run this conference without the first-rate support of the SPIE staff. They make our job easier and allow us to focus on the technical content. We would also like to thank our committee members who help review abstracts, review for the student paper competition, and judge posters. The committee names are listed on the preceding page. Finally, we would like to thank all the attendees who come to give talks, present posters, and participate in the meeting. We look forward to seeing you next year and for many years to come as we continue to collectively develop this technology towards the ultimate goal of improved patient care.

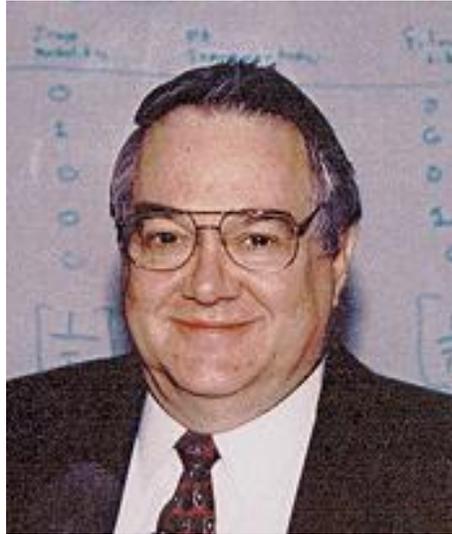
**Michael I. Miga**  
**Kevin R. Cleary**



## **In Memoriam**

### **Sam Dwyer**

**1932–2008**



#### **Inspirational planner for SPIE Medical Imaging symposia and chair of 15 conferences from 1983 to 1996**

Sam Dwyer was a leading light in the swift growth of the field of medical imaging. At this 2008 Medical Imaging symposium, several colleagues expressed their appreciation of his professional achievements and the legacy of his contributions.

Andre Duerinckx recalls Sam's first big step into the limelight. "Sam chaired the Second International PACS meeting sponsored by SPIE in 1983. He stepped in when my professional direction shifted and I could not continue. Over the following years Sam became a leading force in the development of this new science and technology as the conferences developed and grew."

"He had an ability to predict important technology trends in medical imaging," says Steven Horii, a long-time SPIE Medical Imaging contributor and past conference chair.

Another past Medical Imaging conference chair with years of experience, Roger Schneider elaborates, "The growth of the initial conferences was phenomenal. They quickly expanded and outgrew several facilities. Topic areas increased. For example, we had been dealing with perception in sessions on image statistics. Sam first suggested that the field of perception theory and experiment was expanding so rapidly that it deserved its own conference. We also added conferences on image processing hardware, display, functional imaging, and special topics in ultrasound transducers."

"Sam was a true pioneer in our field," continues Schneider. "He was one of the first to envision the impact of digital technology on the storage, retrieval, communication, and

display of medical images, and one of the most active early explorers of the possibilities. He led the PACS conference into the merger with SPIE's image science conference to form the current Medical Imaging Symposium which many consider to be the premiere technical program on medical imaging in the world."

Murray Loew, another past conference chair, adds his observation, "Sam's academic, industrial, and clinical experience provided the perspective that enabled him to set priorities and give advice that helped many of us to make our own contributions. We all benefited greatly from his insights and his practical approach."

Schneider agrees. "Through all, Sam was an excellent partner and leader, calm, gentle yet persuasive, always congenially nudging everyone toward a better future. His ambitions were not for himself, but for the mutual enterprise. He was a very enthusiastic mentor and supporter of students and researchers new to the field without any concern for the possibility that their work might compete with his and was himself a superbly competent contributor."

An example of this is illustrated by John Strauss." Already well accomplished at the time of our first meeting, Sam made the time to take an eager but inexperienced student under his wing. I was not an 'assigned' grad student or research assistant from the University to which he had an obligation. I was a product manager from a vendor-partner. Over the years, from answering technical questions in an understandable way, to providing unassuming career guidance, as well as a sympathetic ear to the challenges of fatherhood or life's many challenges and struggles, Sam was always there for me."

"There are many things about Sam Dwyer that I recall with great fondness, like his always friendly and enthusiastic manner. His advice led me to my years of satisfying work on the ACR-NEMA Committee," adds Horii.

All agree that Sam had many other admirable traits. His wit and sense of humor were legendary, as one of Schneider's favorite memories illustrates. "At the opening of one conference Sam announced, from the podium, that it was the birthday of an important attendee. He said SPIE had requested that the Blue Angels do a flyover—but they already had something scheduled. As a substitute birthday recognition, Sam suggested we take our morning coffee break out on the terrace and watch the landscaping crew circle the flagpole on their riding lawnmowers."

Strauss describes the footprint left by Sam, "While Sam left a legacy through his professional accomplishments, perhaps more lasting is the heritage of leadership he has left behind. He felt it his obligation to pass on his knowledge and wisdom to the next generation, and I was blessed as a recipient. I have and will continue to honor Sam by sharing with those that come after me."

Sam Dwyer was a person of rare quality who will be sorely missed. His name has a permanent place in the annals of medical imaging, and his contributions continue in the flourishing growth of knowledge presented and discussed in the annual Medical Imaging conferences.